[Second Edition.]

PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION.

Improvements in or relating to the Utilisation of Powdered Fuel.

We, JAMES JOHN CANTLEY BRAND, Engineer Captain, Royal Australian Navy, of Australia House, Strand, London, W.C. 2, and BRYAN LAING, Gentleman, of 100, Victoria Street, Westminster, S.W. 1, both subjects of the King of Great Britain, do hereby declare the nature of this invention to be as follows:—

This invention relates to the utilisation of pulverulent or powdered carbonaceous materials, such as powdered raw black coal, lignite, brown coal, coke, the residue from low temperature distillation or carbonisation, pitch, peat and the like, the chief object of the invention being to provide improved methods of handling the same which will enable the materials to be consumed or combusted in a more efficient and economical manner than heretofore.

Provided pulverisation of the carbonaceous material which is to be used as fuel has been carried on to a sufficient degree, that is to say, provided it has been ground so that approximately 95% of the fuel will pass through a 100 mesh screen and approximately 85% through a 200 mesh screen, it has been found that the powdered material can be pumped and handled in more or less the same manner as a fluid, and that the material, provided certain precautions are observed and suitably constructed ejectors or fuel burners and combustion chambers employed, may also be consumed under somewhat similar conditions to oil or gaseous fuel. Nevertheless, its general adoption as a fuel that will replace, or provide an equally efficient alternative to, other fuels, especially oil or gaseous fuels, has been prevented in the past by reason of certain objections associated with its use; for example, it has not been possible up to the present time to combust or consume powdered fuel under the identical conditions, or in substantially the same manner, used for combusting oil or gaseous fuel and at the same time secure the same degree of efficiency obtainable from oil or gaseous fuel.

With the object of removing this last mentioned objection and according to one feature of the present invention, the fluidity of powdered fuel is greatly enhanced prior to its passage through the pipe or pipes leading to the burner nozzles or ejectors by aerating or fluffing up the same by means of gas or air which is applied at a suitable pressure to the powdered fuel while the latter is positioned within a receptacle, which receptacle may, for example, be the main storage bin or else a separate chamber or container. Experiments have shown us that, provided powdered fuel is aerated or fluffed-up to a sufficient extent in this manner it can be caused to behave in identically the same manner as a fluid such as oil fuel or producer gas and not only can it be caused to flow through pipes of the same diameter as those used for oil fuel but also passed through fine adjusting or regulating valves, carburettors and burner nozzles or ejectors of simple and efficient construction and of identical or substantially identical construction to those employed in connection with oil fuel, thus providing the ideal conditions for consuming the powdered fuel so as to obtain therefrom the highest degree of efficiency.

In order to make clear what is meant by enhanced or increased fluidity as used in the present Specification, the following example may be given. Taking the specific gravity of powdered bituminous black coal as 1.5, water being 1, a cubic foot of the solid coal substance will weigh substantially 93 lbs. If this amount of coal is finely powdered and ground

[Price [redacted]

and a cubic foot of space takes up, for example, a weight of 48 lbs. of the powdered fuel, it will be clear that the actual space taken up by the solid material only represents 0.515 cubic feet, or in other words 51.5% of the total space occupied, and that the balance, namely, 48.5% represents inter-air space. We have found that by increasing this inter-air space so that it represents from 30% to 60% of the total space occupied, or in other words by varying the aeration within the limits specified, the fluidity of the finely powdered fuel is increased to such an extent that to all intents and purposes it behaves like a fluid.

For example, we may produce the required degree of aeration of the finely powdered fuel to obtain increased fluidity by locating the fuel within or feeding it to a receptacle or container strong enough to withstand the applied pressure, and into which receptacle air or inert gas is admitted at a pressure greater than that represented by the weight or head of fuel in the receptacle, and ranging approximately from 5 to 100 lbs. to the square inch. The receptacle may be provided with an air and dust-tight opening for charging the same with powdered fuel, or provision may be made for continuously charging the receptacle with powdered fuel in proportion to the quantity of fuel which is fed or forced from the receptacle to the burner or burners. By means of a pump, or from a source or supply of compressed air or gas, or by any other suitable method, air or gas is supplied under pressure through pipes and suitable regulating valves to the top and bottom of the receptacle so as to aerate the fuel from below and apply pressure thereto from above, a pressure gauge being provided, if desired, so as to indicate the pressure prevailing within the receptacle. At its lower end the receptacle is provided with a pipe or pipes leading to a burner or burners or to a fuel injector or injectors, and suitable valve means are provided for controlling the flow of powdered and aerated fuel to the said burner or burners; for example, an inverted needle valve may be provided having a cone at one end which serves to vary the area of the opening through which the powdered fuel passes to the burner nozzle. A scraper may also be provided in the tube or conduit leading from the fuel storage chamber to the burner nozzle. The burner or burners may be located in the combustion space of a boiler, furnace proper, fireplace or the like, and in one application the combustion space may be constituted by a chamber composed of refractory material provided with air spaces for preheating the air necessary for combustion, the air being adapted to enter the combustion space around or near the burner, or the openings may be so arranged that part of the air enters around the burner and a further supply of air is admitted through openings arranged at some distance in advance of the burner, so as to obtain a more intimate mixture of the air and powdered fuel. By means of the pump, or by any other means of supplying pressure or compressed air or gas, any desired degree of pressure may be obtained within the receptacle so that any desired degree of aeration of the powdered fuel may be maintained, thus securing the optimum conditions for giving the highest possible combustible efficiency. The said container may be portable so as to enable it to be used for domestic fireplaces, hot water boilers, heaters, or in cases where heat is momentarily required, or it may be constituted by the bunkers of a steamship or by a receptacle of any desired size or dimensions associated with any type of boiler, furnace, heater, fireplace or the like. A suitable form of portable apparatus comprises a hand or foot pump adapted to pass air through a valve to a storage reservoir associated with a fuel container or receptacle, the reservoir being fitted with a supply pipe at the top and bottom thereof; the lower pipe, the open end of which preferably faces upwards, being adapted to force air through the powdered fuel in the receptacle so as to aerate the same to the required extent and the upper pipe supplying compressed air to the top of the fuel so as to force the same as and when required from the receptacle through the valve controlled passage to a suitable burner. Valves are fitted in both the supply pipes leading to the receptacle so that any desired volume of air or gas can be admitted under control to the receptacle, the latter being fitted if desired, with a pressure gauge. Instead of using a pump, the reservoir can be charged from any suitable source of supply of compressed air or gas, or in lieu of a reservoir, compressed air may be supplied to the receptacle from replaceable compressed air or carbon dioxide cartridges of a suitable size.

It has been found that, if air and powdered fuel are allowed to flow or be pumped or forced by air pressure along a pipe or conduit, the air and the powdered fuel, owing to their different specific gravities, will separate or tend to separate into distinct layers or strata, and, the pipe through which the pow-

dered fuel from the storage reservoir or bin is fed to the burner or burners, may be provided with means such as are described in our co-pending Application No. 25,328 of 1927 (279,767) for carburetting or promoting an efficient admixture of the primary air and the powdered fuel.

Although high temperature or so-called gas works coke possesses a very low volatile content it is unsuitable for use as powdered fuel owing to its hardness and the difficulty of crushing the same, while ordinary high temperature distillation coke also results in the deposit of graphitic carbon on the cell walls which renders the material difficult to grind and consume.

We prefer to employ the residual fuel produced in such a manner that the formation of graphitic carbon in and on the cells of the solid material is avoided and which may have a volatile content ranging from 0% to 5%, or slightly higher, the fuel thus produced being thereafter crushed in any suitable manner to such an extent that approximately 85% thereof will pass a 200 mesh screen. A suitable method of and apparatus for producing a residual coke having the aforesaid characteristics is described in the Specification of Nielsen and Laing's co- pending Application No. 276,407.

Powdered fuel produced in this way can be burnt efficiently in a combustion space of substantially the same dimensions as that employed for other fuels, thus allowing powdered fuel to be used with the highest degree of efficiency in place of oil, lump or gaseous fuel in the existing furnace space of marine, locomotive and other boilers. The fact that the powdered fuel has a very low volatile content also avoids any danger of explosions or spontaneous combustion and allows ordinary air or oxygen to be employed safely for purposes of aeration, pressure, and pumping in lieu of an inert gas. Furthermore, by regulating the volume of gas arising from combustion, which is rendered possible by the fact that a very finely divided fuel is being consumed, the temperature of the furnace can be kept below that at which slag is produced. Consequently, by decreasing the temperature and the velocity of flow of the gases the wear and tear on the refractory linings is decreased, while also allowing ordinary linings to be used if desired.

Dated this 26th day of May, 1926.

J. McCLEARY,
Chartered Patent Agent,
York Mansion, Petty France,
Westminster, S.W. 1,
Agent for the Applicants.

COMPLETE SPECIFICATION.

Improvements in or relating to the Utilisation of Powdered Fuel.

We, JAMES JOHN CANTLEY BRAND, Engineer Captain, Royal Australian Navy, of Australia House, Strand, London, W.C. 2, and BRYAN LAING, Gentleman, of 100, Victoria Street, Westminster, S.W. 1, both subjects of the King of Great Britain, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

This invention relates to the utilisation of pulverulent or powdered carbonaceous or other materials, such as powdered raw black coal, lignite, brown coal, coke, the residue from low temperature distillation or carbonisation, pitch, peat, or other powdered materials, the chief object of the invention being to provide means for handling the same, which, in the case of fuels, will enable the materials to be consumed or combusted in a more efficient and economical manner than heretofore.

It has been proposed to locate powdered fuel within a receptacle and to inject air, or a gas such as steam, under pressure at several points of the interior of the receptacle with the object of loosening and stirring up the fuel in the receptacle in the vicinity of an open-ended feeder leading to the furnace so as to facilitate its passage through the said feeder. In order to discharge the material from the receptacle means were also provided for admitting a separate supply of air under pressure beneath the open-ended feeder so as to whirl up the pulverulent fuel and force the same by injector action through the feeder.

The present invention is based upon the discovery that, if powdered material is located within a receptacle or container and the whole of the material is sufficiently aerated or fluffed up, it can be caused to flow from the receptacle by means of pressure applied to the top of the material, without the necessity of using an open-ended feeder as also an air injector for forcing the powdered material from the receptacle.

According to one feature of the present invention the whole of the powdered material in a receptacle or container, from which the material is to be fed, is aerated or fluffed up so as to increase the normal inter-air space between the particles of fuel by approximately 30% to 60%, the aerated or fluffed up material being thereafter forced from the said receptacle by fluid pressure applied to the material from above.

The powdered material employed is preferably ground so that approximately 95% thereof will pass through a 100 mesh screen and approximately 85% through a 200 mesh screen. Experience has shown us that provided the whole of the powdered material in the receptacle is aerated or fluffed up to this extent and has been finely ground so that approximately 85% will pass through a 200 mesh screen, it can be caused to behave in identically the same manner as a fluid, such as oil fuel or producer gas, and, by merely applying pressure to the top of the material, not only can it be caused to flow through pipes of the same diameter as those used for oil fuel but also passed through fine adjusting or regulating valves, or burner nozzles or ejectors of simple and efficient construction and of identical or substantially identical construction to those employed in connection with oil fuel, thus providing the ideal conditions for consuming the powdered fuel so as to obtain therefrom the highest degree of efficiency. In order to regulate the quantity of material passing from the receptacle due to the fluid pressure which is applied to the top of the fluffed-up material and especially in cases where the material is being supplied from a single receptacle to several fuel burners, a mechanical device, preferably constituted by a screw conveyor, may be provided for ensuring accurate withdrawal of the fluffed-up material from the lower portion of the receptacle.

In order to make clear what is meant by enhanced or increased fluidity as used in the present Specification, the following example may be given. Taking the specific gravity of powdered bituminous black coal as 1.5 water being 1, a cubic foot of the solid coal substance will weigh substantially 93 lbs. If this amount of coal is finely powdered and ground and a cubic foot of space takes up, for example, a weight of 48 lbs. of the powdered fuel, it will be clear that the actual space taken up by the solid material only represents 0.515 cubic feet, or in other words 51.5% of the total space occupied, and that the balance, namely, 48.5% represents inter-air space. We have found that, by increasing the normal inter-air space by from 30% to 60%, or in other words by varying the aeration within the limits specified, the fluidity of the finely powdered fuel is increased to such an extent that to all intents and purposes it behaves like a fluid, and can be caused to flow from the receptacle by applying air or gas pressure to the top of the material in the receptacle.

For example, we may produce the required degree of aeration of the finely powdered fuel to obtain increased fluidity by locating the fuel within or feeding it to a receptacle or container strong enough to withstand the applied pressure, and into which receptacle air or an inert gas, that is to say any gas which is deficient in oxygen and heavier than air, such as combustion gas, is admitted at a pressure greater than that represented by the weight or head of fuel in the receptacle, and ranging approximately from 5 to 100 lbs. to the square inch.

According to another feature of the present invention the receptacle may be provided with an air and dust-tight opening for charging the same with powdered fuel, or provision may be made for continuously charging the receptacle with powdered fuel in proportion to the quantity of fuel which is fed or forced from the receptacle to the burner or burners.

To this end the material may be supplied continuously from a source of supply, to the upper portion of the receptacle above the level of the powdered material contained therein by means, for example, of a feed screw of the Archimedian type which is of considerable length and small clearance, and which will force the powdered fuel into the upper part of the receptacle while preventing powdered fuel being blown back by any pressure prevailing therein. As the powdered fuel is forced into the receptacle by the feeding screw, it will fall through the air or gas in the upper part of the receptacle and be aerated, and will flow out of the receptacle under the influence of the pressure prevailing therein either to the burner nozzles or injectors, or, in cases where the receptacle is located on shore, the powdered material may pass through a pipe line to the storage bunkers on board ship.

The advantage of this arrangement is that a single receptacle can, if necessary, be employed continuously both for the purpose of aerating and also feeding pow-

dered fuel to bunkers on board ship or elsewhere. A single receptacle can also be employed for supplying fuel from any or all of the fuel storage bunkers on board ship or elsewhere to the burner nozzles or injectors of a furnace or furnaces, the rate at which the feed screw or like device supplies powdered fuel to the receptacle being in proportion to the quantity of fuel withdrawn therefrom for combustion in the furnace or furnaces, the fuel feeding device being connected up successively to different bunkers as they become exhausted. As the arrangement is continuous it dispenses with the necessity of employing two receptacles adapted to be charged and emptied alternately.

According to a further feature of the present invention and by means of a pump, or from a source or supply of compressed air or gas, or by any other suitable method, air or gas is supplied under pressure through pipes and suitable regulating valves to the top and bottom of the receptacle so as to aerate the fuel from below and apply pressure thereto from above, a pressure gauge being provided, if desired, so as to indicate the pressure prevailing within the receptacle. At its lower end the receptacle is provided with a pipe or pipes leading to a burner or burners or to a fuel injector or injectors, and suitable valve means are provided for controlling the flow of powdered and aerated fuel to the said burner or burners; for example, an inverted needle valve may be provided having a cone at one end which serves to vary the area of the opening through which the powdered fuel passes to the burner nozzle. A scraper may also be provided in the tube or conduit leading from the fuel storage chamber to the burner nozzle. The burner or burners may be located in the combustion space of a boiler, furnace proper, fireplace or the like, and in one application the combustion space may be constituted by a chamber composed of refractory material provided with air spaces for preheating the air necessary for combustion, the air being adapted to enter the combustion space around or near the burner, or the openings may be so arranged that part of the air enters around the burner and a further supply of air is admitted through openings arranged at some distance in advance of the burner, so as to obtain a more intimate mixture of the air and powdered fuel. By means of the pump, or by any other means of supplying pressure or compressed air or gas, any desired degree of pressure may be obtained within the receptacle so that any desired degree of aeration of the powdered fuel may be maintained, thus securing the optimum conditions for giving the highest possible combustible efficiency. The said container may be portable so as to enable it to be used for domestic fire-places, hot water boilers, heaters, or in cases where heat is momentarily required, or it may be constituted by the bunkers of a steamship or by a receptacle of any desired size or dimensions associated with any type of boiler, furnace, heater, fire-place or the like.

According to another feature of the present invention the portable apparatus comprises a hand or foot pump to pass air through a valve to a storage reservoir associated with a fuel container or receptacle, the reservoir being fitted with a supply pipe at the top and bottom thereof; the lower pipe, the open end of which preferably faces downwards, being adapted to force air through the powdered fuel in the receptacle so as to aerate the same to the required extent and the upper pipe supplying compressed air to the top of the fuel so as to force the same as and when required from the receptacle through a valve controlled passage to a suitable burner. Valves are fitted in both the supply pipes leading to the receptacle so that any desired volume of air or gas can be admitted under control to the receptacle, the latter being fitted if desired, with a pressure gauge. Instead of using a pump, the reservoir can be charged from any suitable source of supply of compressed air or gas, or in lieu of a reservoir, compressed air may be supplied to the receptacle from replaceable compressed air or carbon dioxide cartridges or cylinders of a suitable size.

It has been found that, if air and powdered fuel are allowed to flow or are pumped or forced by air pressure along a pipe or conduit, the air and the powdered fuel, owing to their different specific gravities, will separate or tend to separate into distinct layers or strata, and to prevent this, and also to avoid "flashback" the pipe line through which the powdered fuel from the storage reservoir or bin is fed to the burner or burners, may be provided with an apparatus for carburetting or promoting an efficient admixture of the primary air and the powdered fuel of the kind which is described and illustrated in our co-pending Application No. 25,328 of 1927 (279,767).

In order that the said invention may be clearly understood and readily carried into effect the same will now be described more fully with reference to the accompanying drawing, which shows a part

sectional elevation of a portable form of powdered fuel container constructed according to an embodiment of the present invention.

1 is a fuel storage reservoir and 2 is a hand pump adapted to pass air through a valve 3 and pipe 4 into a compressed air reservoir 5. 6 is a pipe fitted with a valve 6a for supplying air from the compressed air reservoir 5 to the top of the fuel A contained within the fuel receptacle 1; and 7 is a pipe fitted with a valve 7a for supplying fluffing air to the bottom of the material A in the receptacle 1. In the example shown the end 7b of the pipe 7 faces downwards into the fuel receptacle 1. 8 is a passage leading to a burner nozzle 9, the pipe 9 being fitted with an inverted needle valve 10 having an adjusting screw 10a. 11 is a helical plate adapted to impart a whirling movement to the powdered fuel and air as it is forced from the reservoir by the compressed air through the valve 10 to the burner nozzle 9. The combustion chamber 12 is composed of refractory material and is provided with secondary air inlets 13, and 13a, the latter being provided for the purpose of rolling back the fuel and air from the curved wall 12a of the combustion chamber 12 so as to produce a turbulent effect and impart a whirling movement to the fuel and air, as it is ejected from the nozzle 9. The products of combustion leave the combustion chamber 12 at the point 14. The container 1 is fitted with a removable top 15 and also with a pressure gauge 16.

The powdered fuel which it is preferred to employ is that which is obtained by grinding the solid residue remaining after the distillation of carbonaceous materials, for example, the so-called "L & N" fuel obtained by the method described in Nielsen and Laing's Patent Specification No. 276,407, where the volatile content of the solid carbonaceous residue has been reduced approximately to 0% to 6% or slightly higher, the fuel produced in this manner being thereafter crushed so that approximately 85% thereof will pass through a 200 mesh screen. The advantage of using powdered fuel with a low volatile content produced by low or high temperature distillation is that it can be burnt efficiently in a combustion space of substantially the same dimensions as that employed for other fuels, thus allowing powdered fuel to be used with the highest degree of efficiency in place of oil, lump or gaseous fuel in the existing furnace space of marine, locomotive and other boilers without necessitating the use of an auxiliary combustion chamber. The fact that the powdered fuel has a very low volatile content also avoids any danger of explosions or spontaneous combustion and allows ordinary air or oxygen to be employed safely for purposes of aeration, pressure and pumping in lieu of an inert gas. Furthermore, by regulating the temperature of the volume of gas arising from combustion, the temperature of the furnace can be kept below that at which slag is produced. Consequently, by decreasing the temperature and the velocity of flow of the gases the wear and tear on the refractory linings is increased, while also allowing ordinary linings to be used if desired.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A method of enhancing the fluidity of powdered material which consists in locating the same within a receptacle and aerating or fluffing up the whole of the material by means of air or an inert gas so as to increase the normal inter-air space between the particles of material by approximately 30% to 60% and thereafter forcing the aerated or fluffed-up material from the said receptacle by fluid pressure applied to the material from above.

2. A method of enhancing the fluidity of powdered material as claimed in Claim 1, which consists in admitting a gaseous medium to a receptacle containing the powdered material at a pressure greater than that represented by the weight or head of material in the receptacle and ranging approximately from 5 to 100 lbs. to the square inch.

3. A method of enhancing the fluidity of powdered material and causing the same to flow from a receptacle which consists in supplying a gaseous medium under pressure through pipes and suitable regulating valves to the top and bottom of the powdered material located within the said receptacle so as to aerate the material from below and, by applying pressure thereto from above, force the material from the receptacle, a pressure gauge being preferably provided so as to indicate the pressure prevailing within the receptacle.

4. A method of enhancing the fluidity of powdered materials contained within a receptacle, which consists in aerating or fluffing up the same by means of air or an inert gas; forcing the aerated or fluffed up material from the said receptacle by fluid pressure applied to the

powdered material from above, and continuously charging the receptacle with fresh powdered materials in proportion to the quantity of aerated material which is fed or forced out of the said receptacle.

5. Apparatus for carrying out the method claimed in Claim 4 comprising a feed screw for continuously charging the receptacle with powdered material in proportion to the quantity of material which is fed or forced therefrom.

6. An apparatus for use in enhancing the fluidity of powdered fuel comprising a source of supply of a gaseous medium, pipes, fitted with regulating valves, communicating with the top and bottom of a receptacle containing powdered fuel for the purpose of placing the source of supply of the gaseous medium in communication with the receptacle so as to aerate or fluff up the material from below and apply pressure to the same from above, a pressure gauge for indicating the pressure prevailing within the receptacle and a pipe or pipes leading from the said receptacle to a burner or burners, or to a fuel injector or injectors.

7. An apparatus as claimed in Claim 6 wherein valve means are provided for controlling the flow of powdered and aerated fuel from the storage receptacle to the said burner or burners or to the said fuel injector or injectors.

8. Apparatus as claimed in Claim 6 or 7 wherein an inverted needle valve is provided having a cone at one end for varying the area of the opening through which the powdered fuel passes to the burner nozzle or to the injector or injectors.

9. Apparatus as claimed in Claim 6, 7 or 8, in which means are provided in the tube or conduit leading from the fuel storage chamber to the burner nozzles or leading to the injector or injectors for imparting a whirling movement to the powdered fuel and air.

10. A portable apparatus for enhancing the fluidity of powdered fuel and supplying the same to a domestic fireplace, hot water boiler, heater or the like, comprising a hand or foot pump adapted to pass a gaseous medium through a valve to a storage receptacle, said receptacle being fitted with supply pipes at the top and bottom thereof leading to a reservoir containing powdered fuel, the lower pipe being adapted to admit the compressed gaseous medium to the fuel in the reservoir so as to aerate the same to the required extent and the upper pipe supplying the compressed gaseous medium to the top of the fuel so as to force the same, as and when required, from the reservoir to a burner or injector.

11. Apparatus as claimed in Claim 10 in which valves are fitted in both the supply pipes leading to the fuel reservoir so as to control the volume of air admitted to the fuel reservoir, the latter being preferably fitted with a pressure gauge.

12. A modified form of the portable apparatus as claimed in Claim 10 or 11, wherein the gaseous medium is supplied to the fuel receptacle from replaceable cylinders or containers.

13. In a method of enhancing the fluidity of powdered fuel as claimed in Claim 1, 2, 3, or 4, preventing stratification of the air and the powdered carbonaceous material on its way from the fuel storage hopper or reservoir to the burner or injector by providing one or more wire gauze diaphragms in the pipe line, said diaphragm or diaphragms also acting to prevent flashback from the burner or injector.

14. A method of enhancing the fluidity of powdered fuel as claimed in Claim 1, 2, 4, or 13; wherein the inert gas employed consists of combustion gases or a gas deficient in oxygen and heavier than air.

15. The hereindescribed methods of utilising pulverulent or powdered carbonaceous materials.

16. Apparatus for the utilisation of pulverulent or powdered carbonaceous materials having its parts constructed, arranged and adapted to operate substantially as described with reference to the accompanying drawing.

Dated this 17th day of February, 1927.

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Agent for the Applicants.

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281,098 COMPLETE SPECIFICATION

1 SHEET

2nd Edition

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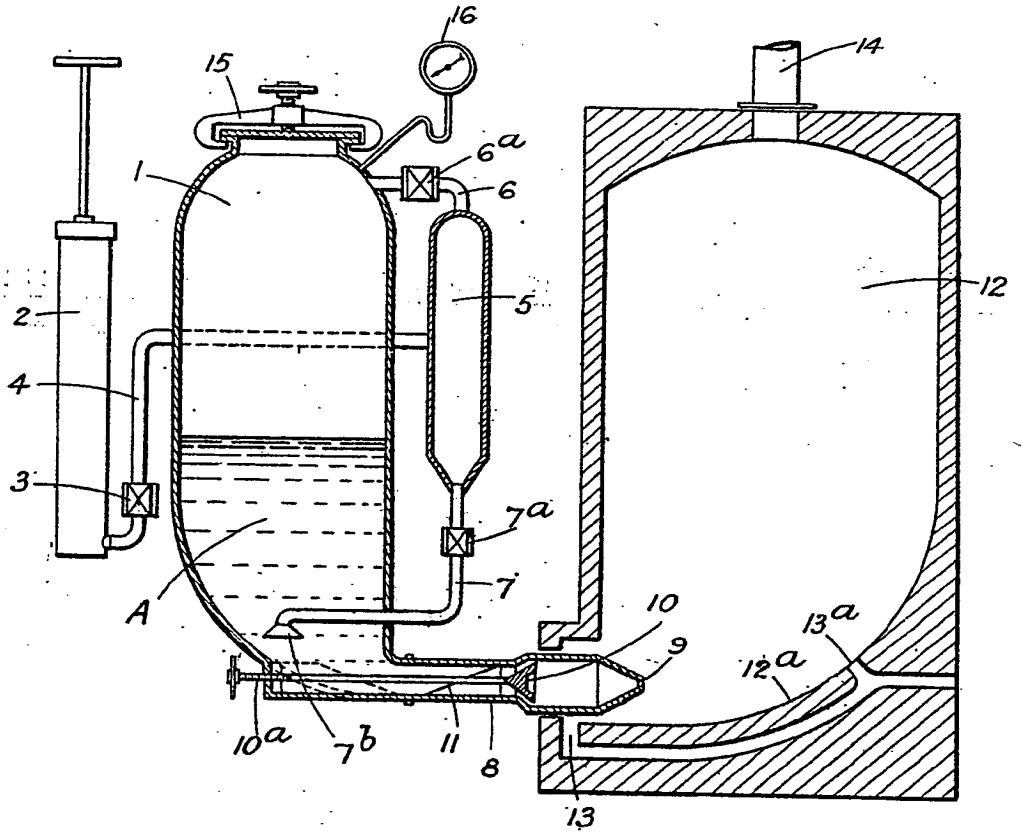

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